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THE HISTORY OF GEOLOGY.

Geschichte der Geologie und Paläontologie bis Ende des 19. Jahrhunderts. Von Karl Alfred v. Zittel. Pp. xi + 868. (München und Leipzig: Druck und Verlag von R. Oldenbourg, 1899.)

WHEN the illustrious author of the "Handbuch der Paläontologie" undertook to write this history of geology and palæontology, he entered upon no light task, for special difficulties must attend the labours of any author who, in bringing together material to illustrate completely the rise and development of these wide-embracing sciences, would produce a volume acceptable to professionals and laymen alike. For such a task as this Prof. Zittel, by his wide scholarship and long experience as a teacher, no less than by his acquaintance with an abundant special literature and his proficiency as a linguist, is eminently qualified; and the work before us amply shows those evidences of patience, thoroughness, and indefatigable zeal, which have characterised the previous literary undertakings of its author. Some idea of the labour involved in the preparation of this volume may be gained from the fact that upwards of 2000 authors receive mention in its pages: it may be doubted indeed whether a single writer whose work has had important bearing on the development of geology in its various branches has been overlooked, while many, the significance of whose labours is unquestionably small, are here accorded recognition. As stated in the author's prefatory remarks, the original scope of the work, which was primarily intended to comprise a history of geology in Germany, was subsequently extended, in accordance with the necessity of treating from a wider standpoint the development and progress of a study to the growth of which all civilised nations have contributed.

The difficulties of expediently arranging so vast an amount of material as that embodied in this work have been perhaps most aptly met by the general plan, chronological and categorical, here adopted. The book is divided into four main sections, each dealing with a given period in the history of the science; and while these periods are of very unequal length, their limits have been so chosen that the mass of detail dealt with under more special headings may be advantageously grouped, thus enabling the reader to obtain the more readily a connected idea of the successive advances made in the study of the subject in its various departments.

The first section, comprising only a few pages, is principally devoted to the works of the ancient Greeks and Romans, and it is clearly shown in what small degree the labours of these early writers have furnished sound foundation for the development of geology in later times. In a short introduction to the second section the author points plainly to those causes which for so many years effectually retarded the progress of scientific thought and discovery, and gave rise to that intellectual lethargy which only became dissipated at the close of the middle ages. The early opinions regarding the nature of fossils, the origin and history of the earth, and the phenomena

of volcanoes and earthquakes, are then successively discussed; and it may be well to indicate here the method adopted by the author in dealing with the work of the numerous observers and writers in these various branches of the subject, for the manner of treatment here employed is more or less closely adhered to throughout the succeeding portions of the book. For the most part under special sub-headings, the work of successive contributors to the science, when the names of these are deserving of more than mere mention, is concisely and impartially summarised, and numerous useful biographical footnotes have been appended. In many cases criticism is totally withheld, and the treatment of the material is in great measure purely objective. In illustration of the thoroughness and impartiality with which the author has carried out his work, we note the space accorded in this second period not only to writers such as Steno, Lehmann, Füchsel and Guettard, whose work has marked important points of progress in these earlier days of geological science, but also to others—for example, Fallopio, Burnet and Justi—whose almost valueless efforts consisted so largely in the proposal of wildly fantastic theories.

The third section, under the happily chosen title "Das heroische Zeitalter der Geologie von 1790 bis 1820," deals with a period which was witness of such remarkable activity in the study of geology; a period during which, indeed, the foundations of the science as we know it to-day may be said to have been laid. Here are to be found some of the most fascinating pages in the book, and the sketches of Saussure, Werner, v. Buch and Humboldt may be cited as examples of apt and terse delineation. But in a work of such wide scope as the one before us, brevity must of necessity characterise the condensed accounts in which are set forth the achievements of these and of other men whose influence has left its indelible mark in the onward march of the science, and we must not look for that degree of fulness and literary embellishment to be found in works of narrower limits, as, for example, in the admirable sketches furnished by Sir Archibald Geikie in his "Founders of Geology." If, in Prof. Zittel's account of Werner and his work, we perceive a certain reluctance to estimate at its true value the detrimental effect produced for a time by the hotly promulgated and falsely based theories of that influential teacher, we speedily find compensation in the eulogistic narratives of Hutton and Playfair, whose philosophical ideas were so effectually opposed to the baneful dogmatism of the Freiberg school.

The development of stratigraphy during this period is dealt with at considerable length, and the progress made in each country receives separate treatment. Prominent amongst the many workers whose labours here find ample record are Freiesleben, v. Buch, Ebel, Brongniart, Cuvier and William Smith. The early development of petrography is then traced, and the views held respectively by the neptunists, vulcanists and plutonists are briefly discussed. In following the progress of palæontology during this time, the author first draws attention to works of a more general character, such as those of Schlotheim, DeFrance and Parkinson, and then proceeds to indicate the advances made by the publication of more special work confined to the consideration of single classes

of animals. With the exception of the important labours and influence of Cuvier, to which both merited tribute and critical consideration are here accorded, this portion of the subject is dismissed with a scantiness of treatment that is somewhat disappointing. In this work geology and palæontology are dealt with together, in correspondence with the fact of their close association and concurrent development, for it is only of comparatively recent years that the study of palæontology has come to be rightly regarded in its true relation to that of zoology.

Fully three-quarters of the volume are occupied by the fourth section, dealing with the newer development of geology and palæontology, and for convenience of treatment the large mass of material here to be incorporated is divided into seven chapters. In the first three of these the more recent advances in the study of cosmic, physiographical and dynamic geology receive careful and detailed attention. In the third chapter we are presented with an excellent summary of the work of Lyell; while from a good epitome and brief criticism of Suess's "Antlitz der Erde" we learn in what high estimation that work is held by Prof. Zittel. The chapter on the development of dynamic geology is throughout exhaustive; but in attempting to give credit to the work of so many contributors, the author must often impose a tax on the attention of his readers. This will be noticeable, indeed, in all these later chapters of the book, when the historian has approached a period in the development of the science marked by an ever-increasing prolificacy in the production of special publications, and as a result of this effort to give recognition to a legion of authors great and small, the pages show a tendency to become burdened with the mere lists of names of many who have contributed to our knowledge in the respective branches of the subject. A chapter devoted to topographical geology, in which the most prominent position is accorded to Germany, gives useful information regarding the growth of geological surveys.

The three concluding chapters deal with the more recent development of stratigraphy, petrography and palæontology. In tracing the growth of stratigraphy, the several geological systems are separately treated, and the Triassic System is dealt with at greatest length. The development of study in the Alpine Trias here finds a prominent place, and in this connection it is noteworthy that Prof. Zittel, even when recounting the progress of a recent warmly-conducted polemic discussion on a question of nomenclature, has succeeded in preserving neutrality. Chapter vi. furnishes a brief though comprehensive account of the later development of petrography, in which the principal work of recent years, for the most part without criticism, is recapitulated.

The volume concludes with an account of more recent labours in palæontology, but it must be with a feeling akin to disappointment that we complete the perusal of this portion of the work. In a chapter dealing with that subject in which Prof. Zittel has acquired his well-merited reputation as the leading authority, the method and fulness of treatment fall below our expectations. The endeavour to refer, though it be by mere mention, to so much that has been of recent years accomplished in this department, and this at the risk of reducing a certain proportion of the text to the character of a mere compen-

dium of authors' names, is here too plainly apparent. By this objective presentation of details the author must in great measure forfeit that interest which a broader and more critical treatment would have commanded.

Great care has been bestowed in editing this work, and such errors as the misspelling of the name "MacCulloch" on p. 165, and the omission of two reference numbers on p. 793, are of rare occurrence. Carefully quoted literature references have been appended, on the whole, with sufficient liberality; but the author's apology for devoting so much space to this purpose appears superfluous, and it must be obvious, especially when looked at from the student's point of view, that frequency in referring to original sources of information can only enhance the value of a book of this kind.

Little need be added in recommendation of this comprehensive work; the terse and lucid style of its author will commend it to English readers. By the completion of his arduous task, Prof. Zittel has well supplied a long-felt want, and all who interest themselves in the study of geology, towards the development of which Great Britain has so conspicuously contributed, will warmly welcome the appearance of this volume from the pen of one who takes rank among the ablest living expounders of a noble science.

F. L. K.

THE FLORA OF NEW ZEALAND.

The Student's Flora of New Zealand and the Outlying Islands. By Thomas Kirk, F.L.S. A Fragment. Pp. vi + 408. Large 8vo. (Wellington, N.Z., 1899.)

List of the Genera and Species of New Zealand Plants. By A. Hamilton. (Wellington, N.Z., 1899.)

IT was well known in botanical circles that the late Prof. Thomas Kirk, of Wellington, New Zealand, who died about a year ago, had long been engaged in the preparation of a comprehensive, descriptive, and illustrated work on the flora of that country; and it was a great disappointment when it transpired that he had left his work in an unfinished state, because it was felt that it would be extremely difficult, perhaps impossible, to find another botanist so well qualified for the task. Prof. Kirk spent some thirty years of his life in the investigation of the flora of his adopted country, and his various writings thereon betoken the careful and accurate botanist. From time to time he published the new species discovered by himself and others; but his fully illustrated "Forest Flora of New Zealand" gave evidence of the extent of his knowledge of his subject. A more remarkable and, in a scientific sense, a more important contribution to the botanical literature of New Zealand is contained in an address delivered before the Philosophical Society of Wellington, N.Z., a few years ago (see *Transactions of the New Zealand Institute*, vol. xxviii.). In this address he dealt with the "Displacement and Replacement of the Native Vegetation of New Zealand" in such a manner as to be of permanent value to science. He has there put on record facts connected with the introduction and colonisation of exotic plants in New Zealand that positively throw a new light, and suggest new ideas, on the present distribution of plants in cultivated countries generally. Fortunately the